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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
09/826,416	04/05/2001	Tatsuya Arao	0756-2293	5035

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EXAMINER
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TRAN, THIEN F

ART UNIT	PAPER NUMBER
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2811

DATE MAILED: 07/10/2003

Please find below and/or attached an Office communication concerning this application or proceeding.

**Office Action Summary**

Application No.

09/826,416

Applicant(s)

ARAO ET AL.

Examiner

Thien Tran

Art Unit

2811

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

**Period for Reply**

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133).
- Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

**Status**

- 1) ☒ Responsive to communication(s) filed on 14 April 2003.
- 2a) ☒ This action is **FINAL**.                      2b) ☐ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

**Disposition of Claims**

- 4) ☒ Claim(s) 2,4,21-24 and 26-42 is/are pending in the application.
- 4a) Of the above claim(s) \_\_\_\_\_ is/are withdrawn from consideration.
- 5) ☐ Claim(s) \_\_\_\_\_ is/are allowed.
- 6) ☒ Claim(s) 2,4,21-24 and 26-42 is/are rejected.
- 7) ☐ Claim(s) \_\_\_\_\_ is/are objected to.
- 8) ☐ Claim(s) \_\_\_\_\_ are subject to restriction and/or election requirement.

**Application Papers**

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on \_\_\_\_\_ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.  
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
- 11) ☐ The proposed drawing correction filed on \_\_\_\_\_ is: a) ☐ approved b) ☐ disapproved by the Examiner.  
If approved, corrected drawings are required in reply to this Office action.
- 12) ☐ The oath or declaration is objected to by the Examiner.

**Priority under 35 U.S.C. §§ 119 and 120**

- 13) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).  
a) ☐ All b) ☐ Some \* c) ☐ None of:  
1. ☐ Certified copies of the priority documents have been received.  
2. ☐ Certified copies of the priority documents have been received in Application No. \_\_\_\_\_.  
3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).  
\* See the attached detailed Office action for a list of the certified copies not received.
- 14) ☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. § 119(e) (to a provisional application).  
a) ☐ The translation of the foreign language provisional application has been received.
- 15) ☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. §§ 120 and/or 121.

**Attachment(s)**

- 1) ☒ Notice of References Cited (PTO-892)                      4) ☐ Interview Summary (PTO-413) Paper No(s). \_\_\_\_\_
- 2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)                      5) ☐ Notice of Informal Patent Application (PTO-152)
- 3) ☒ Information Disclosure Statement(s) (PTO-1449) Paper No(s) 14.                      6) ☐ Other: \_\_\_\_\_

## **DETAILED ACTION**

### ***Specification***

The title of the invention is not descriptive. A new title is required that is clearly indicative of the invention to which the claims are directed, a semiconductor device .

### ***Claim Objections***

Claim 40 is objected to because of the following informalities: line 7, "the first semiconductor films" should be --the pair of first semiconductor films--. Appropriate correction is required.

### ***Claim Rejections - 35 USC § 103***

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

Claims 2, 4, 21-24, 26-31, 33-35, 37-38, 40 and 41 are rejected under 35 U.S.C. 103(a) as being unpatentable over Hirano (USPN 6,222,600) in view of Ho et al. (USPN 5,528,082) and Kim et al. (USPN 6,100,954).

Hirano discloses a semiconductor device (Fig. 4F) comprising a first wiring (2, drain electrode D) and a second wiring (2, pixel electrode E) formed on an insulating surface; barrier metal layers (second conductive film 12) formed on the first and second wirings so as to correspond to the first and second wirings; a pair of first semiconductor films 4 of one conductivity type formed on the barrier metal layers (a second conductive film); a second semiconductor film 5 formed on and extending between the pair of first

Art Unit: 2811

semiconductor films; a gate insulating film 6 formed on the second semiconductor film; and a third conductive film (a gate electrode 7) formed on the gate insulating film, wherein each of the first wiring (first conductive film) and the second wiring (second conductive film) has tapered inner and outer edges.

Hirano does not disclose the thin film structure (layers 12, 4, 5, 6, 7) having tapered sidewalls. Kim et al. shows a thin film structure (Fig. 3D) having tapered sidewalls and Ho et al. also discloses thin film structure having tapered sidewalls with any desired angle of taper no greater than  $60^{\circ}$ . It would have been obvious to a person having ordinary skill in the art at the time the invention was made to form the thin film structure of Hirano having tapered sidewalls with a tapered angle of  $30^{\circ}$  as taught by Ho et al. and Kim et al. in order to reduce step coverage problems. Consequently, the barrier metal layers 12 have a tapered outer edge, the pair of first semiconductor films 4 and the second semiconductor film 5 each has a tapered outer edge and the gate electrode (third conductive film 7) has a tapered outer edge; wherein the gate insulating film extends beyond outer edge of the gate electrode, the second semiconductor film extends beyond outer edge of the gate insulating film and side edges of the gate electrode, and the pair of first semiconductor films extend beyond side edges of the second semiconductor film.

Regarding claims 2 and 4, due to tapered sidewalls of the thin film structure, an end portion of the second semiconductor film 5 is inside an end portion of the barrier metal 12.

Art Unit: 2811

Regarding claims 21 and 26, each of the first wiring and the second wiring comprises aluminum.

Regarding claims 22 and 27, the modified Hirano does not explicitly disclose the first wiring and the second wiring (D, E) comprising an indium tin oxide film (ITO). Indium tin oxide is a known material in the art and routinely used to form wirings and pixel electrodes in semiconductor device as shown for example by Kim et al. (see col. 2, lines 45-47). Therefore, it would have been obvious to one of ordinary skill in the art at the time the invention was made to select ITO as a suitable conductive material for the wirings in Hirano, since it has been held to be within the general skill of a worker in the art to select a known material on the basis of its suitability for the intended use as a matter of design choice. In re Leshin, 125 USPQ 416.

Regarding claims 23 and 28, the modified Hirano does not explicitly disclose the gate electrode (third conductive film) 7 comprising at least one element selected from the group consisting of Ta, Ti and an alloy containing the element. These materials are known in the art and routinely used to form gate electrodes in semiconductor device as shown for example by Kim et al. (see col. 16, lines 66-67 and col. 17, lines 1-2). Therefore, it would have been obvious to one of ordinary skill in the art at the time the invention was made to select any one of these materials as a suitable conductive material for the gate electrode 7 of Hirano, since it has been held to be within the general skill of a worker in the art to select a known material on the basis of its suitability for the intended use as a matter of design choice. In re Leshin, 125 USPQ 416.

Art Unit: 2811

Regarding claims 24 and 29, the recitation "the semiconductor device is one selected from the group consisting of a mobile phone, a video camera, a portable information terminal, a liquid crystal TV receiver, a portable book, a personal computer, a DVD player, and a digital still camera" in the claim preamble specifies an intended use or field of use is treated as nonlimiting since it has been held that in device claims, intended use must result in a structural difference between the claim invention and the prior art in order to patentably distinguish the claim invention from the prior art. If the prior art structure is capable of performing the intended use, then it meets the claim. In *re Casey*, 152 USPQ 235 (CCPA 1967); In *re Otto*, 136 USPQ 458, 459 (CCPA 1963). A claim containing a "recitation with respect to the manner in which a claimed apparatus is intended to be employed does not differentiate the claimed apparatus from a prior art apparatus" if the prior art apparatus teaches all the structural limitations of the claim. *Ex parte Masham*, 2 USPQ2d 1647 (Bd. Pat. App. & Inter. 1987). Furthermore, it is known that all of these devices employ a liquid crystal display device. It would have been obvious to incorporate the liquid crystal display device of the above combined references into these devices for the advantages that the liquid crystal display device provides as described above.

Claims 32, 36, 39 and 42 are rejected under 35 U.S.C. 103(a) as being unpatentable over Hirano (USPN 6,222,600) in view of Ho et al. (USPN 5,528,082) and Kim et al. (USPN 6,100,954) as applied to claims 2, 4 30, 34, 37 and 40 above, and further in view of Oana et al. (USPN 6,008,869).

Art Unit: 2811

The combined references as described above do not disclose the pair of barrier metal layers (12) being formed of Ti or Ta. However, Ti, Ta or Mo are barrier materials known in the art and routinely used to form barrier layers in semiconductor device as shown for example by Oana et al. (see col. 11, lines 22-27). Therefore, it would have been obvious to one of ordinary skill in the art at the time the invention was made to select any one of these materials as a suitable barrier material for the barrier metal layers 12 of Hirano, since it has been held to be within the general skill of a worker in the art to select a known material on the basis of its suitability for the intended use as a matter of design choice. In re Leshin, 125 USPQ 416.

### ***Response to Arguments***

Applicant's arguments with respect to claims 2, 4, 21-24 and 26-42 have been considered but are moot in view of the new ground(s) of rejection.

### ***Conclusion***

Applicant's amendment necessitated the new ground(s) of rejection presented in this Office action. Accordingly, **THIS ACTION IS MADE FINAL**. See MPEP § 706.07(a). Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire **THREE MONTHS** from the mailing date of this action. In the event a first reply is filed within **TWO MONTHS** of the mailing date of this final action and the advisory action is not mailed until after the end of the **THREE-MONTH** shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any

Art Unit: 2811

extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than SIX MONTHS from the date of this final action.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Thien Tran whose telephone number is (703) 308-4108. The examiner can normally be reached on 8:30AM - 5:00PM Monday through Friday.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Tom Thomas can be reached on (703) 308-2772. The fax phone numbers for the organization where this application or proceeding is assigned are (703) 872-9318 for regular communications and (703) 872-9319 for After Final communications.

Any inquiry of a general nature or relating to the status of this application or proceeding should be directed to the receptionist whose telephone number is (703) 308-0956.

tt  
June 25, 2003



Thien Tran  
Patent Examiner  
Technology Center 2800